IN THE UNITED STATES PATENTS AND TRADEMARK OFFICE

KPO-003

Applicant : Naoto Hirosaki et al.

Title : LIGHT EMITTING ELEMENT AND LIGHTING INSTRUMENT

Serial No. : 10/588,007

Filed : August 17, 2006

Group Art Unit : 2879

Examiner : Peter J. Macchiarolo

Hon. Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

DECLARATION UNDER RULE 132

Sir:

We, Naoto Hirosaki, Ken Sakuma, Kyota Ueda and Hajime Yamamoto having a post office address at c/o National Institute for Materials Science of 2-1, Sengen 1-chome, Tsukuba-shi, Ibaraki 305-0047, Japan, declare, as follow:

We are inventors of the above application.

$CaAlSiN_3$ defined in claim 1 of the invention and Ca-α-sialon disclosed in US Publication No. US 2003/0030368 are registered in JCPDS Card No. 39-0747 and JCPDS Card No. 33-0261, respectively, and the crystal structures are known.

The JCPDS Cards and their translations are attached herewith to show the differences of the crystal structures of $CaAlSiN_3$ and Ca-α-sialon.

We hereby declare that all statements made herein of our own knowledge are true, and that all statements made on information and belief are believed to be true, and further that these statements

were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date February 2, 2009 By Naoto Hirosaki
Naoto Hirosaki

Date February 11, 2009 By Ken Sakuma
Ken Sakuma

Date Feb. 3, 2009 By Kyota Ueda
Kyota Ueda

Date Feb. 5, 2009 By Hajime Yamamoto
Hajime Yamamoto

IN THE U.S. PATENT OFFICE

Applicant : Naoto Hirosaki et al.

Title : LIGHT EMITTING ELEMENT AND LIGHTING INSTRUMENT

Serial No. : 10/588,007

Filed : August 17, 2006

VERIFICATION OF TRANSLATION

Sir:

I, Kyoko Nakamura, residing at 2211 Whiteoaks Dr., Alexandria, VA 22306 , declare that I am fluent in Japanese and English, and that herewith submitted English translations of JCPDS Card No. 39-0747 and JCPDS Card No. 33-0261 are true and accurate literal translations.

Date: January 29, 2009

Name and chemical formula

Reference code:	39-0747
PDF index name:	Calcium Aluminum Silicon Nitride
Empirical rule:	$AlCaN_3Si$
Chemical formula:	$CaAlSiN_3$

Crystal structural parameter

Crystal system:	Orthorhombic system
Space group:	C
a (Å):	5.6290
b (Å):	9.5840
c (Å):	4.9860
Alpha (°):	90.0000
Beta (°):	90.0000
Gamma (°):	90.0000
Volume of unit cell:	268.99
RIR:	-

Subfile and quality

Subfile:	Inorganic
	Alloy, metal or intermetalic
Quality:	Indexed (I)

Comment

Specimen preparation:	E-phase. Decomposition product of M-phase ($2CaO:Si_3N_4:AlN$) by hot pressing at 1500 C for 1 hour. Accompanied by AlN phase.

Reference

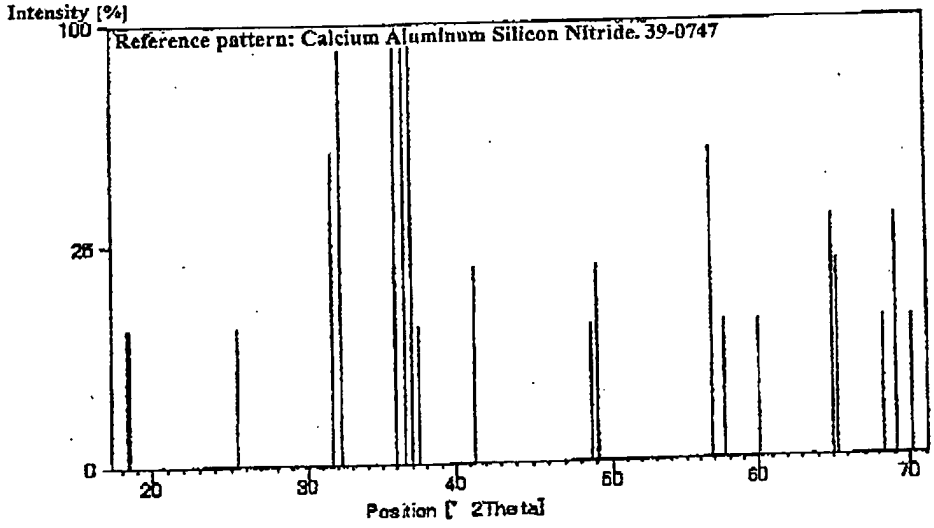
Priority reference:	Huang, Z., Sun, W., Yan, D., *J. Mater. Sci. Lett.*, 4, 255, (1985)

Peak list

No.	h	k	l	d [A]	I [%]

1	1	1	0	4.83900	10.0
2	0	2	0	4.78900	10.0
3	1	1	1	3.48200	10.0
4	2	0	0	2.81900	50.0
5	1	3	0	2.77300	100.0
6	0	0	2	2.49500	100.0
7	2	0	1	2.45300	100.0
8	1	3	1	2.42200	100.0
9	0	4	0	2.39400	10.0
10	2	2	1	2.18300	20.0
11	2	0	2	1.86600	10.0
12	1	3	2	1.85400	20.0
13	3	3	0	1.61800	50.0
14	0	6	0	1.59800	10.0
15	3	3	1	1.53900	10.0
16	2	0	3	1.43300	30.0
17	1	3	3	1.42600	20.0
18	2	2	3	1.37100	10.0
19	3	3	2	1.35600	30.0
20	2	6	1	1.33900	10.0

Line pattern



Name and chemical formula

Reference code:	33-0261
PDF index name:	Calcium Aluminum Silicon Nitride Oxide
Empirical rule:	$Al_{2.8}Ca_{0.8}N_{14.8}O_{1.2}Si_{9.2}$
Chemical formula:	$Ca_{0.8}Si_{9.2}Al_{2.8}O_{1.2}N_{14.8}$

Crystal structural parameter

Crystal system:	Hexagonal system
Space group:	P31c
Space group No.:	159
a (Å):	7.8520
b (Å):	7.8520
c (Å):	5.7090
Alpha (°):	90.0000
Beta (°):	90.0000
Gamma (°):	120.0000
Calculation density:	3.23
Actual measurement density:	3.21
Volume of unit cell:	304.83
Z:	1.00
RIR:	-

Subfile and quality

Subfile:	Inorganic
	Corrosion
Quality:	Indexed (I)

Comment

Color:	Gray
Comment:	α' sialons have the general composition $M_xSi_{12-p}Al_pO_nN_{16-n}$ where M=Li, Ca, Y and 0</=x</=2. They are structurally related to α-silicon nitride, with M atoms occupying large interstices in the silicon–nitrogen framework. Aluminium replaces silicon and some oxygen replaces nitrogen in order to preserve charge balance.

Specimen preparation: CaO. $3Si_3N_4$. 3AlN heated in nitrogen at 1750 C for 15 minutes.

Reference

Priority reference: Thompson, D., *Private Communication*

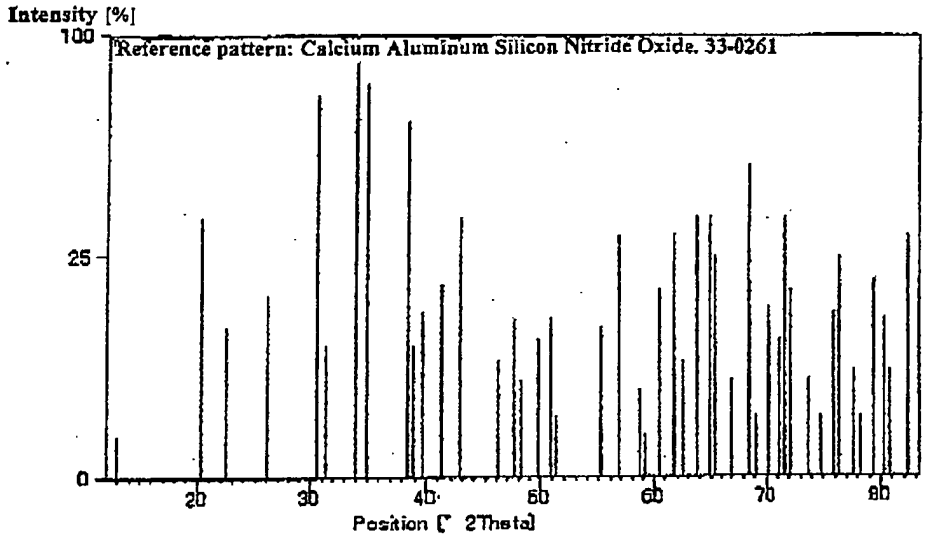
Unit cell: Hampshire, S. et al., *Nature (London)*, 274, 880, (1978)

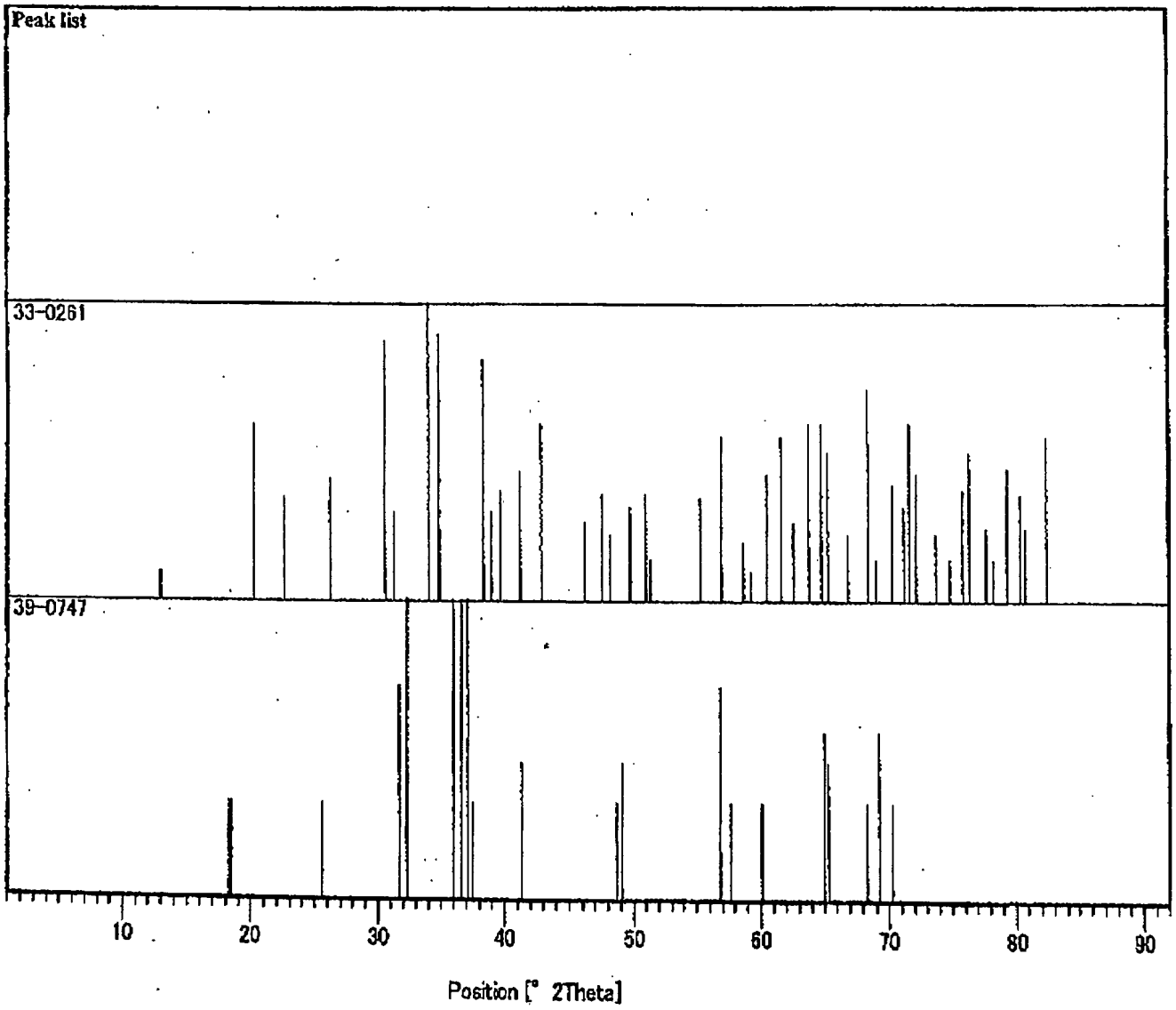
Peak list

No.	h	k	l	d [A]	I [%]
1	1	0	0	6.80200	1.0
2	1	0	1	4.37300	35.0
3	1	1	0	3.92800	12.0
4	2	0	0	3.40100	17.0
5	2	0	1	2.92100	75.0
6	0	0	2	2.85800	9.0
7	1	0	2	2.63200	100.0
8	2	1	0	2.56900	80.0
9	2	1	1	2.34300	65.0
10	1	1	2	2.30900	9.0
11	3	0	0	2.26700	14.0
12	2	0	2	2.18600	19.0
13	3	0	1	2.10600	35.0
14	2	2	0	1.96200	7.0
15	2	1	2	1.91000	13.0
16	3	1	0	1.88500	5.0
17	1	0	3	1.83200	10.0
18	3	1	1	1.79000	13.0
19	3	0	2	1.77700	2.0
20	2	0	3	1.66000	12.0
21	2	2	2	1.61700	30.0
22	3	1	2	1.57300	4.0
23	3	2	0	1.55800	1.0
24	2	1	3	1.52900	18.0
25	3	2	1	1.50400	30.0
26	4	1	0	1.48400	7.0
27	4	0	2	1.45700	35.0
28	4	1	1	1.43600	35.0
29	0	0	4	1.42700	25.0
30	1	0	4	1.39700	5.0
31	3	2	2	1.36900	50.0
32	5	0	0	1.35900	2.0
33	1	1	4	1.33900	15.0
34	5	0	1	1.32300	10.0
35	4	1	2	1.31600	35.0
36	3	3	0	1.30900	18.0
37	4	2	0	1.28500	5.0
38	4	0	3	1.26800	2.0
39	4	2	1	1.25400	14.0
40	2	1	4	1.24700	25.0
41	5	0	2	1.22800	6.0

42	5	1	0	1.22100	2.0
43	3	0	4	1.20700	20.0
44	5	1	1	1.19400	13.0
45	3	3	2	1.18900	6.0
46	4	1	3	1.17000	30.0

Line pattern




Peak list
33-0261
39-0747
10
20
30
40
50
60
70
80
90
Position [° 2Theta]

名前及び化学式

リファレンスコード:	39-0747
PDFインデックス名:	Calcium Aluminum Silicon Nitride
経験則:	$AlCaN_3Si$
化学式:	$CaAlSiN_3$

結晶構造パラメータ

結晶系:	斜方晶系
空間群:	C
a (Å):	5.6290
b (Å):	9.5840
c (Å):	4.9860
Alpha (°):	90.0000
Beta (°):	90.0000
Gamma (°):	90.0000
単位胞の体積:	268.99
RIR:	-

サブファイル及びクオリティ

サブファイル:	Inorganic Alloy, metal or Intermetalic
クオリティ:	Indexed (I)

コメント

試料準備:	E-phase. Decomposition product of M-phase ($2CaO:Si_3N_4$:AlN) by hot pressing at 1500 C for 1 hour. Accompanied by AlN phase.

リファレンス

優先リファレンス:	Huang, Z., Sun, W., Yan, D., *J. Mater. Sci. Lett.*, 4, 255, (1985)

ピークリスト

No.	h	k	l	d [A]	I [%]

1	1	1	0	4.83900	10.0
2	0	2	0	4.78900	10.0
3	1	1	1	3.48200	10.0
4	2	0	0	2.81900	50.0
5	1	3	0	2.77300	100.0
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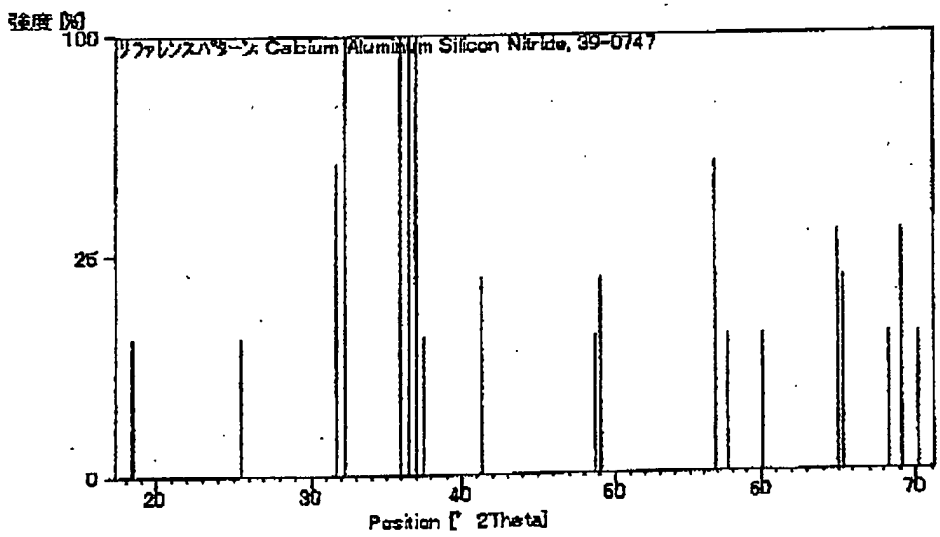
10	2	2	1	2.18300	20.0
11	2	0	2	1.86600	10.0
12	1	3	2	1.85400	20.0
13	3	3	0	1.61800	50.0
14	0	6	0	1.59800	10.0
15	3	3	1	1.53900	10.0
16	2	0	3	1.43300	30.0
17	1	3	3	1.42600	20.0
18	2	2	3	1.37100	10.0
19	3	3	2	1.35600	30.0
20	2	6	1	1.33900	10.0

ラインパターン



名前及び化学式

リファレンスコード:	33-0261
PDFインデックス名:	Calcium Aluminum Silicon Nitride Oxide
経験則:	$Al_{2.8}Ca_{0.8}N_{14.8}O_{1.2}Si_{9.2}$
化学式:	$Ca_{0.8}Si_{9.2}Al_{2.8}O_{1.2}N_{14.8}$

結晶構造パラメータ

結晶系:	六方晶系
空間群:	P31c
空間群No.:	159
a (Å):	7.8520
b (Å):	7.8520
c (Å):	5.7090
Alpha (°):	90.0000
Beta (°):	90.0000
Gamma (°):	120.0000
計算密度:	3.23
実測密度:	3.21
単位胞の体積:	304.83
Z:	1.00
RIR:	-

サブファイル及びクオリティ

サブファイル:	Inorganic Corrosion
クオリティ:	Indexed (I)

コメント

カラー:	Gray
コメント:	α' sialons have the general composition $M_xSi_{12-p}Al_pO_nN_{16-n}$ where M=Li, Ca, Y and 0</=x</=2. They are structurally related to α-silicon nitride, with M atoms occupying large interstices in the silicon-nitrogen framework. Aluminium replaces silicon and some oxygen replaces nitrogen in order to preserve charge balance.

試料準備: CaO, $3Si_3N_4$, 3AlN heated in nitrogen at 1750 C for 15 minutes.

リファレンス

優先リファレンス: Thompson, D., *Private Communication*
単位胞: Hampshire, S. et al., *Nature (London)*, 274, 880. (1978)

ピークリスト

No.	h	k	l	d [A]	I [%]
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17	1	0	3	1.83200	10.0
18	3	1	1	1.79000	13.0
19	3	0	2	1.77700	2.0
20	2	0	3	1.66000	12.0
21	2	2	2	1.61700	30.0
22	3	1	2	1.57300	4.0
23	3	2	0	1.55800	1.0
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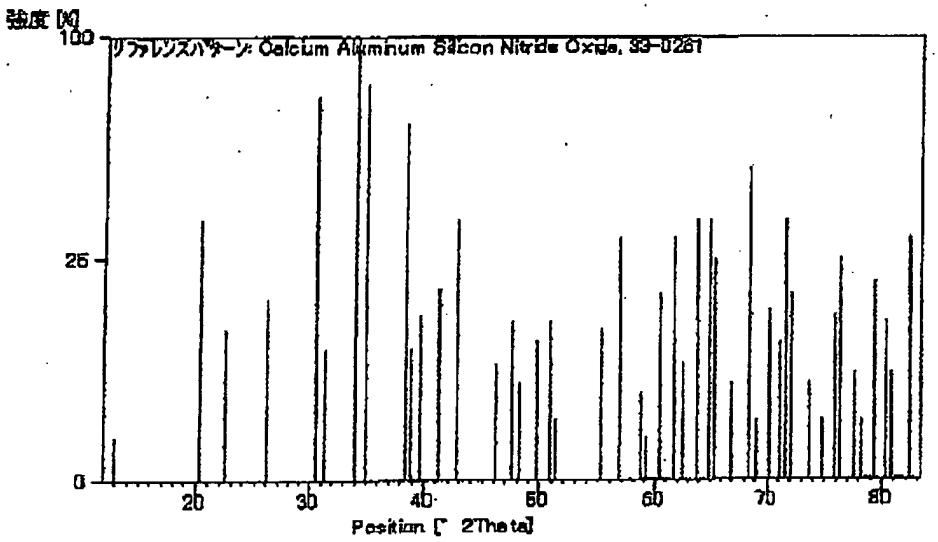
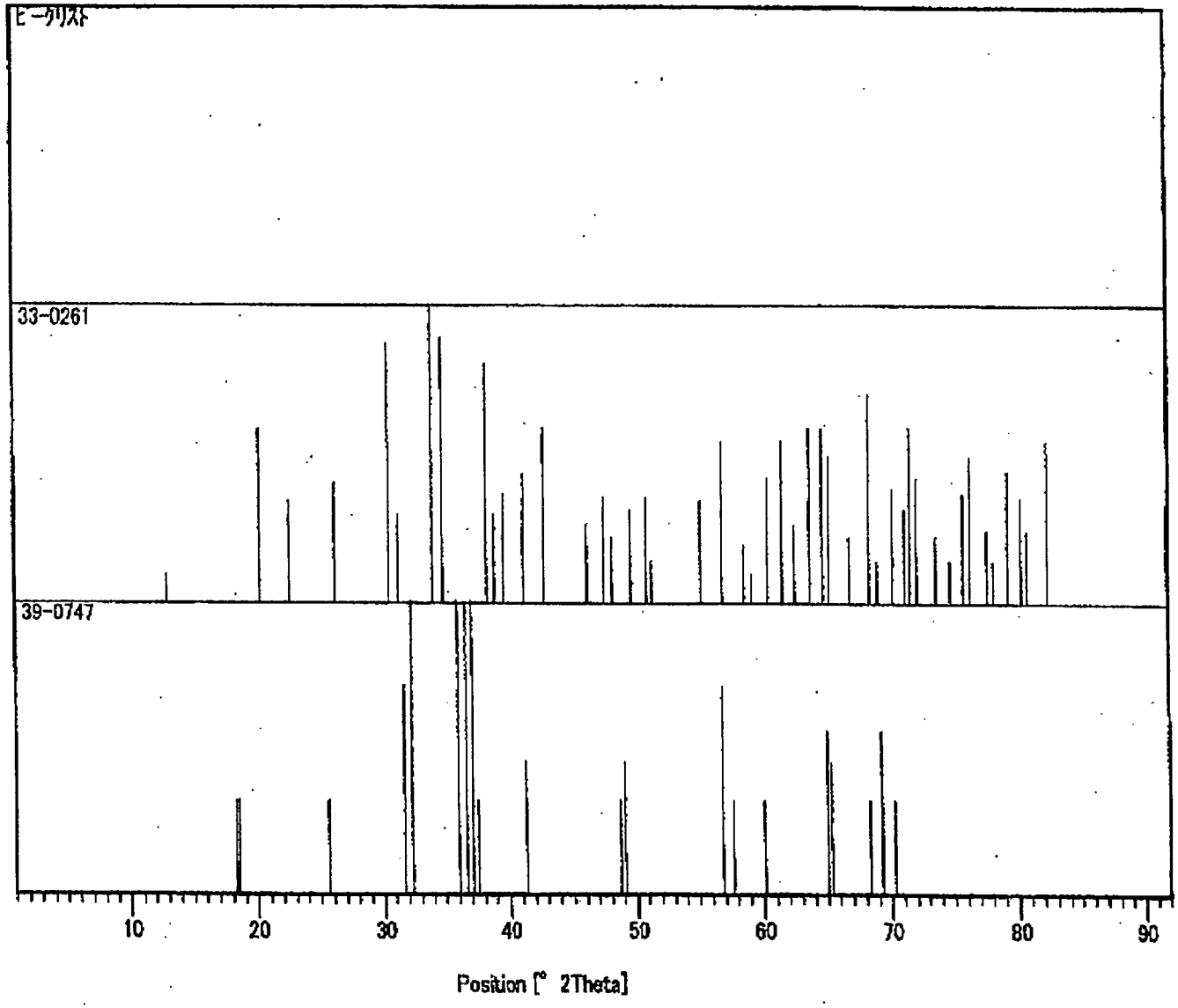
28	4	1	1	1.43600	35.0
29	0	0	4	1.42700	25.0
30	1	0	4	1.39700	5.0
31	3	2	2	1.36900	50.0
32	5	0	0	1.35900	2.0
33	1	1	4	1.33900	15.0
34	5	0	1	1.32300	10.0
35	4	1	2	1.31600	35.0
36	3	3	0	1.30900	18.0
37	4	2	0	1.28500	5.0
38	4	0	3	1.26800	2.0
39	4	2	1	1.25400	14.0
40	2	1	4	1.24700	25.0
41	5	0	2	1.22800	6.0

42	5	1	0	1.22100	2.0
43	3	0	4	1.20700	20.0
44	5	1	1	1.19400	13.0
45	3	3	2	1.18900	6.0
46	4	1	3	1.17000	30.0

ラインパターン




33-0261
39-0747
10
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Position [° 2Theta]